Notice of Allowability	Application No.	Applicant(s)	
	10/533,278	WILLING ET AL.	
	Examiner	Art Unit	
	Sang Nguyen	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Pre-Amendment 04/28/05*.

2. ☒ The allowed claim(s) is/are *11-14 which have been renumbered as indicate claims 1-4*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 04/28/05
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Gregory P. LaPointe (Reg. No. 28,395) on September 13, 2006.

The application has been amended as follows by the Pre-Amendment filed on 04/28/05:

Claim 11 (new): Gas detection method comprising the following steps of providing an initial light signal (~~So~~), by a wavelength modulated laser source (~~2, 34, 36~~), said initial light signal (~~So~~) is wavelength modulated at a first frequency (~~F~~) symmetrically around an absorption line of a gas the concentration or presence of which is to be determined;

passing said initial light signal (~~So~~) having intensity variations over the time resulting from an alternative scanning around said gas absorption line through a gas detection region (~~4,48~~) intended for receiving at least one of said gases;

receiving a resulting light signal (~~S_G~~) exciting said gas detection region (~~4,48~~), by detection means (~~5; 54, 56~~), said resulting light signal (~~S_G~~) comprises changes in the intensity of the initial light signal (~~So~~) due to the gas concentration in the detection region (~~4, 48~~);

generating a detection signal (~~S_D~~) by said detection means (~~5; 54; 56~~) being substantially proportional to the time derivate of said resulting light signal (~~S_G~~);

generating a first measuring signal (~~S_{MF}~~) from said detection signal (~~S_D~~), which is a function of intensity of said initial light signal (~~So~~);

generating a second measuring signal (~~S_{MaF}~~) from said detection signal (~~S_D~~), which is a function of the gas absorption and substantially independent of an intensity modulation of said initial light signal at said first frequency (F);

providing a final measuring signal being independent from the intensity of light incident onto the detection means (~~6, 54, 56~~) by dividing said second measuring signal (~~S_{MZF}~~) by said first measuring signal (~~S_{MF}~~) and thereby providing a signal relative to the presence or the concentration of a given gas.

Claim 12 (new) : Gas detection method according to claim 11, wherein said first measuring signal (~~S_{MF}~~) is generated by multiplying said detection signal (~~S_D~~) with a first modulation reference Signal (~~20~~) at the first frequency (~~F~~) and then integrated over time, and said second measuring signal (~~S_{M2F}~~) is generated by multiplying said detection signal (~~S_D~~) with a second modulation reference signal (~~24~~) at twice of that frequency (~~F~~) and then integrated over time, whereby the first modulation reference signal (~~20~~) and the second modulation reference signal (~~24~~) are exactly defined in phase with the intensity variations of said initial light signal (~~So~~).

Claim 13 (new): A gas detector device comprising:

a wavelength modulated laser source (~~2; 34, 36~~) providing an initial light signal (~~So~~);

a detection region (48) intended for receiving at least one of a gas the concentration or presence of which is to be determined;

supply control means (70) for wavelength modulating said initial light signal (So) at a first frequency (F) symmetrically around an absorption line of one of said gases and providing said initial light signal having intensity variation over the time;

a light sensor (94, 96) respectively arranged at the periphery of said detection region, said sensor is intended for receiving a resulting light signal (S_G) comprising changes in the intensity of the initial light signal (So) having passed through said detection region and providing a detection signal (S_D) proportional to the light intensity variation of said resulting light signal (S_G);

processing means (8; 64, 66, 80, 82, 84, 86, 90) for providing from said detection signal (S_D) a signal relative to the presence or the concentration of a given gas in said detection region; wherein

said light sensor (94, 96) or said processing means comprise means (90) for providing a detection signal substantially proportional to the time derivate of said resulting light signal (S_G); and

said processing means further comprise first means (80) for generating a first modulation reference signal (20) at said first frequency (F) and second means (82) for generating a second modulation reference signal (24) at twice said first frequency (F), first means (84) for multiplying said first modulation reference signal (20) with said detection signal and then integrating over time the resulting signal in order to provide a

first measuring signal (~~S_{MF}~~) which is a function of the intensity of said initial light signal (~~So~~) and substantially independent of the concentration of said gas,

second means (~~86~~) for multiplying said second modulation reference signal (~~24~~) with said ~~said~~ detection signal and then integrating over time in order to provide a second measuring signal (~~S_{M2F}~~) which is a function of the gas absorption and substantially independent of an intensity modulation of said initial light signal (~~So~~) at said first frequency (~~F~~),

a processing unit (~~90~~) for dividing said second measuring signal (~~S_{M2F}~~) by the first measuring signal (~~S_{MF}~~) and providing a signal relative to the presence of a given gas or to its concentration.

Claim 14 (new): The gas detector device according claim 13, wherein supply control means (~~70~~) comprise a first part (~~76~~) for defining a DC current signal and a second part (~~78~~) for defining an AC current signal at said given reference frequency (~~F~~) for generating an alternative scanning of light intensity of said initial light signal (~~So~~) around said gas absorption line.

The following is an examiner's statement of reasons for allowance:

As to method and device claims 11 and 13 are allowable over the prior art for at least the reason that the prior art of record, taken alone or in combination, fails discloses or render obvious a gas detection method comprising all the specific elements with the specific combination including of the step of <u>providing a final measuring signal being independent from the intensity of light incident onto the detection means by</u>

dividing said second measuring signal by said first measuring signal and thereby providing a signal relative to the presence or the concentration of a given gas in combination with the rest of the limitation of claims 11 and 13. The dependent claims 12 and 14 allowed by virtue of their dependence on claims 11 and 13.

The prior art does not teach or suggest the claimed invention of a gas detector method and device of claims 11 and 13 with features "a processing unit for providing a final measuring signal being independent from the intensity of light incident onto the detection means by dividing said second measuring signal by said first measuring signal and thereby providing a signal relative to the presence or the concentration of a given gas. Silver et al reference (US 6,356,350 submitted by applicant) which discloses a wavelength modulation spectroscopy system having a laser, detector, and A/D converter, and a computer for measuring and determining gas concentration from the demodulated frequency components. Goldstein (US 6,172,759 submitted by applicant) teaches that apparatus and method for determining concentration and/or hazard from target gas by means of optically monitoring one or more optical change. Brand et al (US 6, 064,488 submitted by applicant) also mentions a method and apparatus for in Situ tunable diode laser gas concentration measurement in a high temperature having comparing the sample signal the null signal to eliminate influence of laser beam variations and interference patterns. Also, Kalayeh et al (US 6,995,846) discloses the system and method for remote quantization detection of fluid leaks from the natural gas or oil pipeline using laser differential absorption. However, none of references, does not teaches or suggest above features "providing a final measuring signal being

independent from the intensity of light incident onto the detection means by dividing said second measuring signal by said first measuring signal and thereby providing a signal relative to the presence or the concentration of a given gas" in combination with rest of the limitation of claims 11 and 13.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sang Nguyen whose telephone number is (571) 272-2425. The examiner can normally be reached on 9:30 am to 7:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on (571) 272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

September 13, 2006

Sang Nguyen
Patent Examiner
Art Unit 2877